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help she gave to the people about her who needed it—rich as well as poor—will be remembered as long as those who knew her shall live. Some tributes to her greatness have been printed—but no words, written or spoken, can ever tell of all the good she did.

*238 E. Fifteenth St., New York, N. Y.*

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## COURTSHIP IN BIRDS.

BY CHARLES W. TOWNSEND, M. D.

THE difference between the mentality of birds and of man is enormous and we must be on our guard against imputing purely human motive to the lower animals. On the other hand the difference between man and the lower animals in many important matters is not one of kind, but one merely of degree.

A gull will drag a dried fish from the upper beach to the water to soften it before eating, a grackle will dip a tough bit of biscuit in the water for the same purpose, and a man will soften a hard crust in his coffee. How much is sub-conscious instinct or reflex action in some or all of these cases and how much is self-conscious reasoning and forethought—it is not my purpose to discuss here. To call it instinct in all cases in the lower animals and reason in all cases in man may possibly savor of conceit.

The desire to live, to obtain food and to mate are primitive inborn instincts common to both the lower animals and to man. To gratify these instincts similar actions are resorted to by both the lower animals and man. The actions of a child desiring food from a table and those of a dog under the same circumstances are very much alike. Each appeals by voice and actions for the food, each is anxious to please the owner of the food, and each—unless the point has been reached in its experience of life when it fears the consequences of unlawful acts—will avail itself of an opportunity to surreptitiously snatch the food.

In the same way the desire of the male bird to please the female more than its rivals please the same bird appeals to us as a very

reasonable and very human point of view. This is what leads to courtship, and in this courtship rivalry it is natural to suppose that the best bird wins. Although it has been somewhat the fashion of late to decry Darwin's theory of sexual selection and to substitute others for it, its simplicity and common sense still appeal to many, and it is worth while occasionally to consult the original text.

Darwin published his 'Origin of Species' in 1859. In Chapter IV he says he is led "to say a few words on what I have called Sexual Selection. This form of selection depends, not on a struggle for existence in relation to other organic beings or to external conditions, but on a struggle between the individuals of one sex, generally the males, for the possession of the other sex. The result is not death to the unsuccessful competitor, but few or no offspring. Sexual selection is, therefore, less rigorous than natural selection. Generally, the most vigorous males, those which are best fitted for their places in nature, will leave most progeny. But in many cases, victory depends not so much on general vigor, as on having special weapons confined to the male sex. A hornless stag or spurless cock would have a poor chance of leaving numerous offspring.

"Amongst birds, the contest is often of a more peaceful character. All those who have attended to the subject, believe that there is the severest rivalry between the males of many species to attract, by singing, the females. The rock-thrush of Guiana, birds of paradise, and some others, congregate; and successive males display with the most elaborate care, and show off in the best manner their gorgeous plumage; they likewise perform strange antics before the females, which, standing by as spectators, at last choose the most attractive partner.

"I cannot here enter on the necessary details; but if man can in a short time give beauty and an elegant carriage to his bantams, according to his standard of beauty, I can see no good reason to doubt that female birds, by selecting, during thousands of generations, the most melodious or beautiful males, according to their standard of beauty, might produce a marked effect."

Eliot Howard,<sup>1</sup> on the other hand, believes that display and extravagant bodily antics are merely "reflex actions directly re-

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<sup>1</sup> The British Warblers.

sulting from any excessive excitement, that they are not confined solely to courtship and do not in any way influence the female." The fact that the brilliantly arrayed male Argus Pheasant and the dull-colored Savin's Warbler both spread out and raise their wings and tails during courtship seem to Howard a strong argument against sexual selection.

Pycraft<sup>1</sup> says, "In these pages it is contended that neither brilliant coloration nor any other form of ornamentation is to be ascribed to the direct action of 'sexual selection.' That is to say such conspicuous features have not been dependent on the action of formal choice for their survival and development, but are rather the 'expression points' of the internal, inherent growth variations, which, not being inimical to the welfare of the species, have been free to pursue their development in any direction which apparent chance may dictate." In another place he says: "The frills and furbelows"—crests, vivid hues, etc., can—"be traced to the stimulating action of the 'hormones' which control both pigmentation and structure, as is shown by the fact that both are modified by any interference with the glands in question. Such ornamental features then are the concomitants, not the results, of sexual selection," and again "sexual selection, other things being equal, operates by according the greatest number of descendants to the most amorous and not necessarily to those of the highest hues." He is therefore willing to admit that amorous behavior by song and dance and display of plumage influence and attract the female but he objects to the bold statement that she selects the male. Such mental qualifications satisfy those who would cast aside Darwin's theory of sexual selection, but after all is said this theory, if not taken too literally, explains the facts better than any other. It is not necessary to assume that the female critically examines the display of color, dance or song of the rivals and balances them in her mind, but if we admit, as Pycraft is willing to do, that she is attracted and influenced by these, even if only in a reflex or sub-conscious way, we have practically admitted the truth of Darwin's theory. The fittest male in any or all of these respects will be more likely to perpetuate the race.

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<sup>1</sup> Courtship of Animals.

The motives of display of color, dance and song are easily understood, for in one form or another they have all been used in human courtship. The likenesses are fundamental and extend from the lowest to the highest in the human species, but are most strikingly seen in the lowest, more primitive races.

Although at the present day and among the highest developed human races the display of bright colors is more marked among the females than the males, it must be remembered that this is a recent development. Only a few generations back the males, instead of wearing black or sombre clothing, were as brilliantly apparelled as the females, and among savages it is the male that is strikingly bedecked with feathers, tatoo markings and paint, while the female is quiet enough in her apparel or lack of apparel. The tendency of the highly civilized male to revert to brilliant display of clothing is shown in his fondness for military finery and for striking colors when he is freed from the restraining hand of convention, as witness the cow-boy and the sportsman.

In both bird and man the display of bright colors and attractive patterns, the dance and the song, even if of courtship origin and competitive in character, may lose the conscious sexual side and be continued at other times for mere pleasure, in other words the original incentive for display, song and dance may be entirely lost, but that does not seem to me to be any argument against the theory of sexual selection.

The explanation of the brilliant colors of male birds on a mere physico-chemical basis due to exuberance of vitality, the maleness of the males, or the stimulation of the hormones in the courtship season fails to account for the fact that the brilliance of display in this season may occur without the growth of new feathers, but merely by the wearing down of old feathers and the unveiling of concealed patterns. This is true in the case of the Snow Bunting, the Junco and the Chewink, and is strikingly shown in the case of the English Sparrow, where the process goes on all unnoticed at our feet.

The ultra-concealing-colorationists say that the brilliant colors serve to conceal, but one who has watched Eiders in the north, even though he admits that the green and white and black may match the iceberg and the sea and the rocks, is as sure that the

colors are for display and for conspicuousness as he is that black is black and white is white. The speed with which the male discards his brilliant dress when the spring madness is over seems to bear him out in this opinion.

A recent writer<sup>1</sup> in 'The Auk' states his opinion, that the brilliant colors and markings of the group of warblers "act as a uniform, facilitating the recognition by a bird of its own kind just as they facilitate its recognition by a bird student." How then does he account for the fact that the females and young, who need most to be identified, are most obscurely marked, and who can doubt that birds can not only identify their own species with ease no matter how poorly marked, but can pick out even their own offspring from others? Does a Chinese woman have any difficulty in recognizing her own offspring in a group of hundreds, all similarly dressed and looking alike as peas to our untrained eyes? Or, to bring the matter nearer home, watch a mother enter a school-yard in which a hundred small children all of the same age and dress are playing. She picks out her own child, brushes its dress and wipes its nose with a perfect certainty of conviction as to its identification, but if asked for the field marks, is unable to give them.

That the brilliant colors and markings of birds are of use in courtship and that many of them are the slow result of sexual selection seems to me to be a reasonable supposition because the male bird in courtship always displays these colors and markings to the best advantage. Where two or more males, as is often the case, are eagerly doing their best in display it would seem natural that the one who makes the most display is more likely to excite and win the female. If this were not the case the display would fall into innocuous desuetude. Mr. William Brewster once told me the interesting case of a pair of Summer Tanagers in the south where he shot the male. In a short time the female appeared with another male. This one also he shot and so on until he had obtained three or four of this female's spouses. On careful examination of plumage it was seen that the most brilliant plumage was possessed by number one and that the brilliancy decreased successively in the others.

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<sup>1</sup> J. T. Nichols. Auk, 1912, XXXVI, P. 228.

The fact that the brilliant plumage is assumed in many birds for the nuptial season only seems to bear out the importance of display for courtship. The ducks go into the eclipse plumage immediately after the courtship season. The brilliantly marked male Wood Duck and the Eider alike assume the modest and quiet dress of the female. This is true of many other birds. The Bobolink and the Scarlet Tanager, the Goldfinch and the Myrtle Warbler doff their striking dress in the fall and appear in the modest apparel of the female and immature.

Courtship means the act of wooing in love. Whatever theory we accept we must admit that the male *appears* to endeavor to attract the female in one or all of three ways: first by a *display* of bright or striking colors, secondly by postures or movements which accentuate this display or call attention to his agility or skill—in other words by the *dance* in its broadest sense—and thirdly by sounds either vocal or instrumental—*song* in its broadest sense.

The classical courtship of the Peacock illustrates in an extreme form the display of color. It also includes the two other factors of dance and song. It may well be sketched here as an exaggerated form and epitome of our subject.

In the presence of the hen and when in an amorous mood the Peacock erects the stiff tail feathers which support the marvelous plumes that arise from the back and form the upper tail coverts. He walks with mincing steps, turning this way and then that, so that his beauty may be seen from all points by the hen who walks carelessly by. Seen from in front, his blue-green head and neck with black and white face markings and tufted plumes stand out like a Chinese jade carving in the center of a concave sea-shell of shimmering green, embossed at regular intervals with eyes of marvelous beauty and detail. From behind, the stiff gray tail feathers supporting the shell are seen to be set off below by an abundance of black and white down. The wings of brown and blue frame the sides. Suddenly the Peacock turns and flashes the full radiance of his beauty directly at the hen, he vibrates his downward stretched wings and quivers his stiff tail feathers so that they give forth a sound of rattling reeds. The green disk is thereby set all of a tremble in time with this instrumental music,

the great bird bows towards the object of his affection, emits a raucous cry, and the green, quivering sea shell curves beseechingly towards her. Who can resist such fascination?

But all birds are not so well fitted for display as the Peacock who appears to have reached the very acme in this direction, but a study of some of the less brilliant birds bears out, perhaps more clearly, the efforts of the male in display. The male Red-winged Blackbird, when engaged in feeding on the ground, appears as a simple black bird. Sometimes not a trace of color is visible, although he may show a narrow yellow line or a somewhat broader line with red in it on his shoulders. When engaged in courtship these same shoulders blaze with scarlet color. Not only are the surrounding black feathers pushed back so that the epaulets are broad and conspicuous, but each individual scarlet feather is erected and the epaulets are thick and striking. Not only that, but he flies slowly and directly towards the female and the beauty spots are displayed to her eyes, if she will but bestow a glance at them, under the most favorable and dazzling circumstances.

The male Eider swimming about and bowing to the female suddenly rises up on his tail in the water and flashes out the magnificent jet black shield on his belly, a color that ought not to be there according to the concealing colorationists. In the same way the Merganser drake displays his splendid white shirt front with its delicate tinge of salmon pink.

The male Bittern, as he strides about, extends the fluffy white feathers from under the wings in striking display. The male Blue-headed Vireo puffs out the yellow flank feathers till he seems nearly double the size of the slender female, and the Myrtle Warbler droops his wings to display his yellow rump and puffs out the yellow and black feathers on his sides.

The Black Guillemot as he courtesies to the female in the water opens wide his mouth and displays for her admiration the scarlet lining. The display of the inflated orange-colored neck-sacks of the Heath Hen is but a small part of the remarkable courtship display of this bird.

The Black Duck and the Domestic Pigeon in the ardor of courtship take short flights by the females and the white lining of their wings become momentarily in evidence. The Golden-eye drake



displays from time to time his brilliant orange-yellow tarsi and feet above the water as he performs his song and dance before the modest duck. Incidentally, and perhaps accidentally at first, he increases the display by the spurt of water caused by the movement of the foot. In the Merganser this spurt of water has evidently become of primary importance and is a most conspicuous feature, but it is plain that it arose from an endeavor to display a colored foot. From a display of color it has become a form of a dance with an added mechanical feature. All three factors of courtship are so intricately mingled that it is not always possible to treat of a single one alone.

Secondly the dance, using the word in the broadest sense, is frequently employed in avian courtship. In the simplest form the bird spreads its tail, slightly opens its wings and puffs out its feathers. This may be done rhythmically, and, with each motion, the song is emitted, for song and dance are almost always associated. The Bronzed Grackle illustrates this simple dance and at the same time very simple song. In slightly more elaborate form the bird may also bob its head and with still more elaboration swing or sway its whole body or jump up and down. The Blue-headed Vireo, for example, bobs and bows in addition to puffing out its yellow flanks, the Cowbird, besides puffing and spreading, bobs its head and swings its whole body, the Bluebird in the excitement of courtship jumps up and down on its perch and the Flicker bobs and courtesies in true cake-walk fashion.

That the dance does not necessarily mean leg movements is exemplified not only by birds but by various primitive human races where posturing and movements of the head, arms and trunk may constitute a large part of the performance. Among the ducks the movements of the head and neck are sometimes very striking and bizarre. The Golden-eye, besides performing with its feet in the way already described, has a remarkable head and neck dance and posturing in the courtship. The drake extends its head and neck straight forward like a bowsprit, then vertically upwards, then backwards so that the occiput rests on the rump, and lastly forward to the normal position. Black Ducks, Baldpates, Buffle-heads and others make short springs and flights from the water; Mallards, Scaups and Pintails bob

or bow and Red-breasted Mergansers courtesy with a swinging dip of the whole body. Bowing and courtesying are as common in avian as in human courtship.

Among our birds the Gannet has perhaps the most elaborate dance, one that in completeness and in many of its features suggests the dance of the Laysan Albatross so well described by Prof. W. K. Fisher.<sup>1</sup> It is worth while describing this dance of the Gannets in detail, for, as far as I can discover, there is no description of it in any American ornithology and I have found no mention of it in the pages of the 'Nuttall Bulletin' or 'The Auk.' Mr. P. A. Taverner<sup>2</sup> is the only one in this country who has referred to this dance as far as I know, and his description is very brief and omits many of the most interesting details. He calls it "a sort of conventionalized ritual." A fuller description is given by Mr. J. H. Gurney<sup>3</sup> in his monograph on the Gannet. He says: "This sort of thing can be seen, with variations, any fine day in July, on the Bass Rock, but it cannot be the affection of courtship, because the courting season is passed." He ascribes it to the affection of the Gannets for each other.

The bowing and posturing and other strange antics of the Laysan Albatross is spoken of by Prof. Fisher as "a curious dance, or perhaps more appropriately a cake-walk," and he goes on to say: "This game or whatever one may wish to call it very likely originated in past time during the courting season, but it certainly has long since lost any such significance. I believe the birds now practise these antics for the pure fun they derive." These remarks I believe apply exactly to the dance of the Gannets. I spent many hours this last summer under most favorable conditions near the great Gannet nesting ledges on the Cliffs of Bonaventure Island, P. Q., and I saw the dance repeated by hundreds of pairs many times and I came to the conclusion that Prof. Fisher did in the case of the Laysan Albatross, namely that it was originally a courtship dance and that it was continued from habit and from the joy of it, in the same way that the Song Sparrow continues to sing long after the nuptial season.

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<sup>1</sup> Auk, XXI, 1904, pp. 8-20.

<sup>2</sup> The Gannets of Bonaventure Island, Ottawa Naturalist, XXXII, 1918, p. 24.

<sup>3</sup> The Gannet, p. 377.

Let me describe a typical performance: As the sexes are alike in plumage they cannot be distinguished apart. One of them, we will assume it is the male, is swinging around in great circles on rigidly outstretched and motionless wings. He passes within a few yards of me and swings towards a shelf crowded with birds brooding their downy, black-faced young. Alighting on the edge he elbows his way along the ledge, notwithstanding the angry looks, the black mouths suddenly opened and the vicious pecks of his neighbors. All of these he returns in kind. Arrived at his nest he is enthusiastically greeted by his mate, who, disregarding the young bird beneath her, rises up to do her part in the dance. The birds stand face to face, the wings slightly raised and opened, the tails elevated and spread. They bow towards each other, then raise their heads and wave their bills as if they were whetting these powerful instruments, or as if they were performing the polite preliminaries of a fencing bout. From time to time this process is interrupted as they bow to each other, and appear to caress each other as each dips its pale blue bill and cream-colored head first to one side and then to the other of its mate's snowy breast. With unabated enthusiasm and ardor the various actions of this curious and loving dance are repeated again and again and often continue for several minutes. After the dance the pair preen themselves and each other, or the one first at the nest flies away and the new arrival waddles around so as to get back of the nestling, and the strange process of feeding takes place.

This dance is not only performed by pairs as just described, but not infrequently individuals perform a *pas seul*, it may be because he or she is wearied with waiting for its mate. The wings are slightly raised and opened, the tail elevated and spread, the bill pointed vertically upwards and waved aloft, then dipped to one side under the half open wing and then to the other, the bill raised and waved again and so on over and over again. Owing to the great volume of sound from the ledges it is impossible to distinguish any individual performer, and I was unable to tell at what point in the dance and to what extent the song was important. The sound is like that of a thousand rattling looms in a great factory, a rough, vibrating, pulsing sound—*car-ra, car-ra, car-ra*.

The movements in the air that may or may not be accompanied with song may be classed in this division of the dance. The Bobolink, rising in irregular circles, or progressing in a horizontal plane on rapidly vibrated down-curved wings, is expressing his amorous feelings by dance as well as by song. His flight often concludes by a rapid descent with wings pointing obliquely upward, forming a display by posture and motion—in themselves forms a dance. The ardor of courtship bears many a bird aloft, and he expresses his feelings with his wings as well as with his voice. One may name not only the Oven-bird and the Maryland Yellow-throat, the Bobolink and the Orchard Oriole, the Semipalmated Sandpiper and the Upland Plover, the Horned Lark and the Pipit, but many other birds in this category, some of which, like the Song Sparrow, sing chiefly from a perch. The Horned Lark mounts silently to a great height and pours forth his song in long periods, sometimes out of sight in the low-lying clouds. The Pipit sings as he ascends nearly vertically and, arrived at the summit of his ambitions, descends quickly, still singing, to the earth.

All birds who indulge in flight song are apt to quiver their wings rapidly in their ecstasy. Sometimes this motion of wings becomes of primary importance and the bird flies with quivering wings but voiceless, or even vibrates his wings rapidly from a perch. This sometimes happens in birds that ordinarily sing at the same time. I have seen it, for example, in the Song Sparrow. The Pheasant quivers his wings rapidly but nearly noiselessly, then emits his vocal crow to be followed by a loud clapping of the wings. The Ptarmigan vibrates his wings rapidly in flight and calls at the same time; the Spruce Partridge flies from a tree stub to the ground with audibly vibrating wings, while the Ruffed Grouse stands on a log and, by the rapid whirring of his wings, emits his characteristic 'drumming.' That this drumming is evolved from a flight song and that there was once a vocal part of the performance, I have little doubt. These examples show the stages in the evolution.

The loud clapping together of the wings behind the back in Domestic Pigeons during flight and their habit of soaring with wings obliquely upwards, although common at all times, are

most marked in the courtship season and are probably of courtship origin. The V-shaped pose of the tail-feathers of the Bronzed Grackle is probably of the same nature for it is discarded in mid-summer.

Both the Savannah and the Vesper Sparrow stand or walk on the ground and elevate and sometimes vibrate their wings rapidly above their backs. They also fly slowly a short distance above the ground with head and tail up and wings rapidly fluttering and deliver their song.

The rapid headlong plunges of the Nighthawk may be classed as a display of motion, a form of the dance. Incidentally, and perhaps accidentally at first, a loud booming sound is produced by the rush of air through the wing feathers. This instrumental music is now the important feature, although the dance is by no means a negligible one. The Raven turns a rolling-over somersault in the air, and the Marsh Hawk plunges from a great height, loops the loop or turns a sidewise somersault. The Chat with dangling legs dances crazily about in the air, and the Kingbird executes a series of zig-zag and erratic flights, emitting at the same time a harsh double scream. This is a true courtship flight song but it is neither graceful to our eyes or pleasing to our ears. The taste of the Kingbird in these matters appears to us to be poor.

The impossibility of treating in turn only one of the primary divisions—display, dance and song—is well shown by these examples. The case of the courtship of the Heath Hen is still more difficult for all three factors are inextricably mingled. I have already alluded to the display of the neck-sacks of this bird, orange in color and shape, a very striking and beautiful feature, but secondary or incidental to the production of 'song' to be described later. The erection of the neck-wings which ordinarily help cover the deflated neck-sacks, the spreading and erection of the tail, the vibration of the down-stretched wings, the pirouetting and turning of the body and the rapid stamping of the feet in this species are all forms of the dance.

Lastly, in this brief review and rough classification of the courtship actions of birds, the song is to be considered. By song I do not mean necessarily a melody or musical strain pleasing to human ears—although many of these produced by the higher species of

birds are extremely pleasing—but any sound which is customarily connected with courtship. Courtship song, as thus understood, may be either vocal or instrumental. The rattling of the stiff tail feathers of the Peacock and the rolling drum made by the wings of the Ruffed Grouse fall into the instrumental category. The rapid stamping of the feet by the Heath Hen produces a ratta-tat-tat like that made on a kettle drum. The tooting sound, similar to that made by blowing across the top of a bottle, produced by the neck-sacks of this same bird, should, I suppose, be classed as instrumental song. The sounds made by the clapping together behind the back of the wings of the Domestic Pigeon, of the clapping on the sides of the Pheasant are, of course, in the instrumental class.

The Woodcock in his wonderful courtship flight, as he ascends straight up in the dim light of early morning or late evening, gives forth loud sounds that cease whenever the bird sets his wings and momentarily soars—instrumental sounds made apparently by his wings. During the last part of the ascent and during the descent he gives forth sweeter vocal notes or whistles. Before he is again on the wing he emits at intervals loud vocal *peents*, preceded by faint gulping sounds accompanied by a puffing out of the body and slight raising of the wings.

The Wilson Snipe flies about in his ecstatic courtship when the light is so poor that it is difficult to observe his flight, and sounds arise—quavering or bleating in character—which are believed to be instrumental in their nature, due to the passage of the air through his stiff primary feathers. The loud booming or whirring sound made by the Nighthawk in his spectacular plunges has already been mentioned, an instrumental music of curious character.

The drumming of the Flicker on a hollow stub or on a roof or chimney-pot is clearly to be classed as instrumental music. I have heard this bird interrupt his spring song to drum and later continue with his vocal music.

The song of courtship produced by the vocal organs of the bird varies from the rasping, vibrating note of the Golden-eye or the *aa-ou* of the Eider, emitted at the height of the dance and display, the harsh scream of the Kingbird or the *tis-ik* of the

Henslow' Sparrow to the clear, plaintive, whistle of the White-throated Sparrow, and the serene, spiritual hymn of the Hermit Thrush. While the simpler, more primitive songs are given forth only during courtship excitement, it is evident that many, especially the more complicated and aesthetic ones, although at their best and sometimes elaborated or extended under courtship excitement, are often continued and repeated for the mere enjoyment of the performer in his own music. The autumnal recrudescence of the amatory instinct, often displayed in song, is well known.

The subject of bird song is one apart by itself, and I have alluded to it in this brief manner merely to round out the classification, made in the beginning of this paper, of *display*, *dance* and *song*—the important features of bird courtship.

98 Pinckney St., Boston, Mass.

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## OBSERVATIONS ON THE HABITS OF BIRDS AT LAKE BURFORD, NEW MEXICO.

BY ALEXANDER WETMORE.

(Concluded from p. 247.)

19. ***Botaurus lentiginosus*** (Montagu). AMERICAN BITTERN.—One was heard pumping in the rushes several times on the morning of May 29. Another was found at the first of the small lakes in the canyon below on June 11. It was pumping also so that it is possible the Bittern breeds here.

20. ***Ardea herodias*** Linnaeus. GREAT BLUE HERON.—Present during migration. Three were seen on May 29, and one on May 30 and June 3.

21. ***Egretta candidissima candidissima*** (Gmelin). SNOWY HERON. Found at Lake Burford during migration. One was seen at the crossing of the Brazos River below Park View, N. M., on May 23, and another was observed at Lake Burford that evening. Two were noted at the lake on May 26, and another was seen on the morning of June 5. One flew past the cabin several times on the evening of that day and finally alighted in the rushes nearby where it was collected. It was an adult